

Tillaga að verkefni á nýjan vegvísi um rannsóknarinnviði 2025

Titill verkefnis: Infrastructure for Electromagnetic diagnostics, compatibility and compliance testing.

Heiti stofnunar: Háskólinn í Reykjavík.

Vinsamlegast hafið eftirfarandi atriði í huga við gerð tillögunnar

Umsækjandi þarf að svara öllum liðum hér að neðan. Þar sem stendur „Texti“ er hægt að skrifa texta, setja inn myndir eða töflur.

Tillögum að innviðum á vegvísi um rannsóknarinnviði skal skilað á þar til gerðu eyðublaði. Ekki er leyfilegt að eiga við uppsetningu eyðublaðsins.

Skjalið „Tillaga að innviðum á vegvísi um rannsóknarinnviði“ skal að hámarki vera þrjár blaðsíður, auk forsíðu, eða samtals fjórar blaðsíður. Nota skal leturgerð og leturstærð eins og stillt er í eyðublaðinu, þ.e. 11 punkta Calibri (body). Ekki er leyfilegt að breyta breidd spássú eða beyta fyrirsögnum í eyðublaðinu. Umsókn skal senda inn sem PDF-skjal.

Festur til að skila inn tillögum er til 12. september 2024, kl. 15.00.

Nánari upplýsingar er að finna á [heimasíðu Innviðasjóðs](#) og hjá sérfræðingum Innviðasjóðs hjá Rannís í gegnum tölvupóstfangið innvidasjodur@rannis.is

Lýsing á tillögu til birtingar á heimasíðu Innviðasjóðs

1. Samantekt: Stutt lýsing innviðum

Electromagnetic Compatibility (EMC) testing is crucial for verifying adherence to regulatory standards and ensuring that devices do not emit excessive electromagnetic radiation, which could interfere with other electronic devices or communication systems. The infrastructure is comprised of an anechoic chamber, test equipment for radiated immunity (e.g. signal generator, RF power amplifier, field probes etc.), test equipment for conducted immunity (e.g. power sensors, attenuators, etc.), radiated emissions (test receiver, pre-amplifiers and antennas), conducted emissions (e.g. current probe, line impedance stabilization network etc.). This equipment is fully capable of conducting comprehensive EMC testing in compliance with both CE and FCC requirements. Additionally, it would serve as a valuable enhancement to the existing electromagnetism experimental facilities in Iceland.

2. Meginmarkmið með uppbyggingu innviða?

According to Cognitive Market Research, the global EMC Testing market is projected to reach USD 5.3 billion by 2024, with a CAGR of 2.5% from 2024 to 2031. This growth is driven by the increasing reliance on automated technology. The growing use of electronic devices across industries, particularly in IoT, telecommunications, automotive electronics, and consumer electronics, necessitates thorough EMC testing to eliminate electromagnetic interference and ensure reliability and safety. This demand is further amplified by the development of new medical devices that require extensive EMC testing for safe and reliable performance in healthcare settings. EMC compliance is essential for obtaining CE and FCC approval for new and existing equipment. However, EMC testing can be costly, especially for small businesses or startups, and requires specific testing environments to ensure accurate results, posing logistical challenges and increasing costs.

The proposed infrastructure would give Icelandic companies engaged in research and development in electronics and communications a local platform for experimentation and verification, and most importantly, local competence in EMC testing and certification. This would minimize costs and shorten time to market for established manufacturers, and remove a giant hurdle for startups and smaller developers to marketize their products. This infrastructure would also serve as a basis for training and employing EMC specialists in Iceland that can offer their services to domestic and foreign clients.

Secondly, the EMC chamber will play an important role in the scientific research conducted at Icelandic universities, especially in terms of high-frequency measurements of antennas and antenna systems but also material properties. EMC chambers are used for measurements such as radiated immunity, to make sure that the equipment under test operates satisfactorily when subject to a strong radiated electromagnetic field. Recently it has been found that EMC chambers can be used to measure material properties such as absorption cross section (ACS), specific absorption rate (SAR), average absorption/reflection coefficient, permittivity, or total scattering cross section (TSCS). These tests are essential in many practical applications, including wearable and implantable antennas and sensors. Furthermore, the chamber can be used to measure shielding effectiveness (SE) and calibrate E-field probes, but also to quantify the complete passive over-the-air (OTA) performance of multipoint antennas for multiple-input

multiple-output (MIMO) systems, essential, e.g., for the emerging area of 5G/6G wireless communication, or specialized devices for ambient energy harvesting, radio-frequency identification, Internet of Things (IoT), medical devices include in vitro diagnostics and accessories that are electrically powered or incorporate functions or sensors implemented using electrical or electronic circuitry. The availability of the EMC chamber will greatly extend the experimental base in Iceland in terms of high-frequency engineering and permit measurement procedures that are beyond the capabilities of current equipment (e.g., standard vector network analyzers and the 1-40 GHz anechoic chamber).

3. Hvernig mun innviðaupbyggingin stuðla að nýliðun og leiða til aukins samstarfs og betri nýtingar innviða?

Today there is no comprehensive infrastructure in Iceland for testing electromagnetic compatibility. Icelandic companies must go abroad for EMC testing, which is costly and time consuming. There is, however, considerable competency in electromagnetic research and experimentation, particularly with regard to antenna development at Reykjavík University.

The infrastructure would offer a common facility for EMC testing and verification that would be useful for all electronics and communications businesses in Iceland as well as the universities. In addition, the expertise developed around these facilities would be of great value. Not least because it could be used for dissemination of EMC competency and awareness among designers and researchers alike. This is of paramount importance as requirements on EMC are becoming more stringent and ubiquitous. This infrastructure would serve as a vehicle to educate Icelandic engineers in EMC compliance, giving them an important competitive advantage.

4. Hverju munu innviðirnir breyta miðað við stöðuna í dag?

Companies engaged in manufacturing electronic and communications devices spend considerable time and money on compliance testing. This is often an iterative process that requires several testing phases. The cost of a failed compliance test includes not only the repeated travel, design and test costs; but also the lost time may give a competitor first entry to the market.

EMC testing is important for all electronics manufacturers, but for start-ups and smaller companies it can be an immense obstacle. It will be imperative for small companies to be able to consult with local EMC experts and conduct tests without associated travel costs and time allocated during the design process. Furthermore, the planned infrastructure would facilitate and increase the range of international collaboration that brings essential know-how and expert knowledge to Iceland thereby strengthening both local academia and industry enterprises.

The proposed infrastructure can significantly enhance Iceland's capacity to address various societal challenges, including but not limited to the following areas:

1. **Enhancing Public Safety:** By ensuring that critical infrastructure and devices, such as medical equipment, communication systems, and transportation controls, are free from electromagnetic interference, the proposed infrastructure can improve the reliability and safety of these systems. This reduces the risk of malfunctions that could endanger public safety.

2. Promoting Technological Innovation: Advanced EMC testing facilities provide a platform for research and development, supporting the creation of new technologies and products. This is particularly important for emerging fields such as 5G/6G communication, IoT devices, and medical technology, which require rigorous EMC testing to ensure performance and compatibility.
3. Supporting Economic Growth: Robust EMC testing infrastructure can attract high-tech companies, such as National Instruments and SMIC, to Iceland, fostering economic growth. Local businesses can benefit from accessible EMC testing services, reducing development costs and accelerating time-to-market for new products.
4. Meeting International Standards: State-of-the-art EMC facilities help Icelandic products comply with international standards, facilitating easier entry into global markets. This is crucial for maintaining competitiveness in a global economy.
5. Protecting the Environment: EMC testing helps minimize electromagnetic pollution, protecting both human health and the environment. This aligns with Iceland's strong commitment to environmental sustainability.

By addressing these areas, the development of EMC testing infrastructure will equip Iceland with the tools needed to effectively tackle future societal challenges.

5. Framtíðarsýn uppbyggingar og reksturs

For the first three years, the facilities would be used for pre-compliance testing, as three years worth of testing data are needed for full compliance certification. This time would also be used for training of users from industry and academia based on currently available expertise in electromagnetics at Reykjavík University, University of Iceland and from industry. This would be the first step in developing local expertise and testing capabilities.

Once full compliance certification is achieved, the facilities will be open to users, both domestic and foreign. It is assumed that founding members will be given reduced price, priority access or other incentives to take part in the original investment. This is a matter of negotiation for a later stage.

It is assumed that participating universities will cooperate to offer education in the field of EMC.

6. Áætluð fjármögnunarþörf næstu ár

The investment cost for this equipment is roughly 800,000 Euros. Annual operational costs are estimated to be roughly 20,000,000 ISK and include calibration, salaries and rent.

A survey of four major players in the Icelandic electronics industry indicates that their combined annual cost of EMC compliance testing is upwards of 20,000,000 ISK. This does not include all of the companies in the field, nor does it take into account tests that are not performed because of cost of testing. From these considerations the revenue from domestic testing should easily cover operational costs. A more detailed analysis of domestic, and foreign, revenue is needed as well as an estimate of the economic advantage of developing local expertise in EMC design and manufacturing.